REMARKS

The rejection of claims 1, 2, 21-26 and 29-43 under 35 USC 112, first paragraph, as failing to comply with the written description requirement, is respectfully traversed.

Applicant has amended claim 1, deleting the limitation "minor amounts, etc. not exceeding 0.03 wt. %" as objected to by the Examiner. Instead, claims 2 and 32 were combined into claim 1. Claims 42 and 43 have also been amended, replacing the expression "higher than" with the expression - -of at least- -. In addition, claims 2 and 32 have been cancelled.

Accordingly, the rejection of claims 1, 21-26, 29-31, and 33-43 under 35 USC 112, should be withdrawn.

The rejection of claims 1, 2, 21-26, 29-31, 34-37, 42-43 under 35 USC 103 as being unpatentable over the US Patent Publication to Nakamura is respectfully traversed.

Applicant has amended claim 1 to incorporate the limitation of claims 2 and 32 both of which have been cancelled. Original claim 32 was considered by the Examiner to be novel and non-obvious. In addition to the limitations of claims 2 and 32, the claims are clearly patentable over the teaching in Nakamura for the following reasons:

In the subject application, the components as claimed are within a much narrower range as compared to Nakamura; for example, the AL-range is 7 times narrower, the Zn-range is 12 times narrower and the Sn-range is also 7 times narrower. Although one of ordinary skill in the art might be motivated to admix these three components, there is no basis for an allegation of obviousness with regard to their admixture in the claimed range without the need for excessive experimentation. To move from the claimed narrower ranges for each of the three elements as indicated above to the

broad ranges disclosed in Nakamura would require 7x12x7 combinations, even without consideration of the claimed elements Ca and Si.

The instant invention is directed to a new composition which incorporates the selection of certain known elements in a narrow range not known from the prior art. The composition of this application achieves unexpectedly superior properties at elevated temperatures relative to the prior art. Nakamura's alloy is intended for use at ambient temperatures and not at the elevated temperatures of the subject invention. The values from figures 6, 8, 11 and 12 in Nakamura, as cited by the Examiner, cannot be compared to alloy compositions suitable at temperatures up to 200°C and will not inherently possess the same characteristics at these temperatures. In fact, applicant during the development of the alloys of the subject invention considered compositions in the ranges of the prior art, and has attached hereto comparison Tables 6 and 7 which show the comparison between the claimed alloys and alloys in the Nakamura's preferred ranges. The compositions and properties of the claimed alloys (according to Examples 1 to 14 in the instant application) are taken from Tables 2 and 5 of the application, whereas comparative Examples 6 to 10 were not shown in the instant application. All comparative examples exhibit inferior properties at elevated temperatures, without exception. It can be seen that higher aluminum (i.e., higher relative to the instant application) together with higher zinc (e.g., comparative example 10), or higher aluminum together with low calcium (e.g., comparative example 7), provide alloys with lower TYS at 175°C than the instant alloys, and the difference is still more prominent at 200°C. Similar effect can be seen for CYS in Table 7. The creep properties at elevated temperatures are better by two orders for the instant alloys (compare MCR values in Table 7).

The above comparison clearly demonstrates that Nakamura does not inherently possess the characteristics of the subject invention. Applicant is willing, if necessary, to submit a 132 Affidavit attesting to the above comparison. However, in light of the fact that claim 1 has been amended to combine the subject matter of claims 2 and

32, it is clear that there is no basis whatsoever for the allegation of obviousness based upon the teaching of Nakamura. Accordingly, claims 1, 21-26, 29-31, 34-37, 40 and 42-43 are clearly believed patentable over Nakamura.

The rejection of claims 1-2, 21-26, 29, 30, 34-36, 40 and 42-43 under 35 USC 103 based upon the teach of JP 02047238 is respectfully traversed.

Once again, the Examiner is reminded of the fact that claim 1 has been amended to incorporate the limitation of previous claims 2 and 32 which have been cancelled.

The alloys according to said JP document are not intended for high temperature applications, but for vibration-damping which is a field extensively explored in Japan, for "smart" building construction materials that can absorb and reduce vibrations caused, e.g., by earthquake or wind. The JP document discloses a hydride, composition containing 15 elements not present in the alloys claimed in the subject application. Such hydride is so obviously different from the instant alloy composition that there is no reason to suppose that this absolutely different mixture might have similar properties at elevated temperatures. Moreover, the presence of hydrogen makes the material rather sensitive to high temperatures. Applicant has demonstrated using the attached comparison Tables 6-9 that the claimed composition has unexpectedly superior behavior at elevated temperatures for the selected ranges of elements in combination as compared to Nakamura's alloys. Here, in case of the JP document, the composition is absolutely different. Even if, by a strange coincidence, the JP material had some of the required temperature properties, alloys of the invention have an advantage of much simpler composition over the JP material and do not require inoculating molten Mg with hydrogen do not include yttrium, niobium, molybdenum, cadmium, or toxic materials. By the way, merely the absence of toxic cadmium in the instant alloy composition represents clear advantage over the JP material.

For all of the above reasons, the rejection of claims 1, 21,-26, 29, 30, 34-36, 40 and 42-43 based upon JP 02047238 should be withdrawn.

The rejection of claims 31-33, 37-39 and 41, under 35 USC 103(a) as being unpatentable in view of USP 6,139,651 to Bronfin is respectfully traversed.

The Examiner states that Bronfin discloses a creep rate and tensile properties in tables 4 and 8 under similar conditions as claimed in the subject application. This is simply not the case. The creep properties in Bronfin are substantially different and materially worse than that in the subject application. This may not have been obvious to the Examiner because the values presented in Bronfin are presented as ratios of secondary creep rate and ambient temperature yield strength. However, it should be noted that the creep properties in Bronfin were measured at temperatures of 135°C which is substantially lower than the temperature in the subject application as set forth in claim 1. To make the comparison more evident, additional data is attached hereto not presented in the cited patent, which enables comparison of the materials according to the present invention with the materials in Bronfin. Tables 8 and 9 demonstrate the superior properties of the instant alloys at high temperatures. Example 1 to 14 are copied from the application, and new comparative examples 11 to 19 have the compositions in the range of the cited Bronfin's patent.

The compositions taught in Bronfin are patent alloys which contain rare-earth elements, do not contain tin and has less calcium. Apparently, there is a misunderstanding about the compositions and intermetallic compounds taught in Bronfin as referred to in the last paragraph before the Conclusion on page 7 of the Examiner's letter. Bronfin's patent has no table 6, and the Bronfin's composition does not include tin at all. Moreover, intermetallics, including $Al_2(Ca,Sn)$ and $Al_2(Ca,Sn,Sr)$ are present only in the instant alloys, which is one of the differences that distinguish these from Bronfin's alloys.

In addition, the alloys disclosed in Bronfin exhibit inferior behavior at high temperatures relative to the alloys of the instant application, i.e. at much higher creep rates as claimed in claim 1.

For all of the above reasons, the rejection of claims 31-33, 37-39 and 41 under 35 USC 103(a) as being unpatentable in view of Bronfin '651, should be withdrawn.

Reconsideration and allowance of claims 1, 21-26, 29-31 and 33-43 is respectfully solicited.

Respectfully submitted,

Eugene Lieberstein
Reg. No. 24,645

ANDERSON, KILL & OLICK
1251 Avenue of the Americas
New York, New York 10020-1182
(212) 278-1000

MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 20231-1450 on September 2, 2004.

OIPE JC134
SEP 0 7 2004
PATENT & TRADEMARK OFFICE

CLAIMS

1. (Currently amended) A magnesium based ~~die-casting~~ alloy having ~~high strength creep resistance and~~ high tensile yield strength (TYS) at elevated temperatures of at least up to 175°C , and exhibiting minimum creep rate (MCR) less than $1.7x10^{-9}$/s at 150°C under stress of 100 Mpa, consisting essentially of:

i) at least 85.4 Wt% Mg,

ii) 4.7 to 7.3 wt% aluminum,

iii) 0.17 to 0.60 wt% manganese,

iv) 0.0 to 0.8 wt% zinc,

v) 1.8 to 3.2 wt% calcium,

vi) 0.3 to 2.2 wt% tin,

vii) 0.0 to 0.5 wt% strontium and

up to 0.0004 wt% iron, up to 0.001 wt% nickel, up to 0.003 wt% copper, and/or up to 0.03 wt% silicon

~~and having minor amounts of other elements with each additional other element not exceeding 0.03 wt%~~.

2. - 20. (Canceled)

21. (Previously Presented) An alloy according to claim 1, comprising up to 0.001 wt% beryllium.

22. (Previously Presented) An alloy according to claim 2, comprising up to 0.001 wt% beryllium.

23. (Previously Presented) An alloy according to claim 1, further comprising incidental impurities.

24. (Previously Presented) An alloy according to claim 1, which contains 5.9 to 7.2 wt% aluminum, 0.9 to 2.1 wt% tin, 2.1 to 3.1 wt% calcium, and 0.2 to 0.35 wt% manganese.

25. (Previously Presented) An alloy according to claim 2, which contains 5.9 to 7.2 wt% aluminum, 0.9 to 2.1 wt% tin, 2.1 to 3.1 wt% calcium, and 0.2 to 0.35 wt% manganese.

26. (Previously Presented) An alloy according to claim 21, which contains 5.9 to 7.2 wt% aluminum, 0.9 to 2.1 wt% tin, 2.1 to 3.1 wt% calcium, and 0.2 to 0.35 wt% manganese.

27. - 28. (Canceled)

29. (Previously Presented) An alloy according to claim 1 exhibiting a marked response to aging at 250°C, wherein tensile yield strength, compressive yield strength, and creep resistance increase.

30. (Previously Presented) An alloy according to claim 1 which is beryllium free.

31. (Previously Presented) An alloy according to claim 1, which exhibits tensile yield strength at ambient temperature higher than 170 Mpa and tensile yield strength at 175°C higher than 150 Mpa.

32. (Previously Presented) An alloy according to claim 1, which exhibits minimum creep rate (MCR) less than 1.7×10^{-9}/s at 150°C under stress of 100 Mpa.

33. (Previously Presented) An alloy according to claim 1, which exhibits minimum creep rate less than 4.9×10^{-9}/s at 200°C under stress of 55 Mpa.

34. (Previously Presented) An alloy according to claim 1, which exhibits improvements of its strength in course of temperature aging at 250°C for 1 hour.

35. (Previously Presented) An article which is a casting of a magnesium alloy of claim 1.

36. (Previously Presented) An article of claim 35, wherein the casting is chosen from the group consisting of high-pressure die-casting, sand casting, permanent mold casting, squeeze casting, semi-solid casting, thixocasting and thixomolding.

37. (Previously Presented) An article according to claim 35 which exhibits tensile yield strength at ambient temperature higher than 170 Mpa and tensile yield strength at 175°C higher than 150 Mpa.

38. (Previously Presented) An article according to claim 35 which exhibits minimum creep rate (MCR) less than 1.7x10-9/s at 150°C under stress of 100 Mpa.

39. (Previously Presented) An article according to claim 35 which exhibits minimum creep rate less than 4.9×10^{-9}/s at 200°C under stress of 55 Mpa.

40. (Previously Presented) An article according to claim 35 which was subjected to temperature aging at 250°C for 1 hour.

41. (Previously Presented) An alloy according to claim 1, comprising in its structure grains of Mg-Al solid solution or Mg-Al-Sn solid solution, and an intermetallic compound chosen from Al_2Ca, $Al_2(Ca,Sr)$, Al_xMn_y, $Al_2(Ca,Sn)$ and $Al_2(Ca,Sn,Sr)$, wherein said intermetallic compounds are located at grain boundaries of said Mg-Al solid solution or Mg-Al-Sn solid solution.

42. (Currently Amended) An alloy according to claim 1 having tensile yield strength (TYS) ~~higher than~~ 140 Mpa at 200°C.

43. (Currently Amended) An alloy according to claim 1 having compressive yield strength (CYS) ~~higher than~~ 140 Mpa at 200°C.

OIPE JC134
SEP 0 7 2004
PATENT & TRADEMARK OFFICE

Table 6. Chemical Compositions of Alloys

Alloy	Al %	Mn %	Zn %	Ca %	Sn %	Sr %	Si %	Fe %	Ni %	Cu %	Be %
Example 1	4.7	0.29	-	1.9	1.8	0.3	0.01	0.002	0.0006	0.0005	-
Example 2	5.3	0.31	0.3	1.8	0.3	-	0.01	0.002	0.0005	0.0006	0.0005
Example 3	5.1	0.30	-	2.9	1.0	-	0.01	0.003	0.0006	0.0006	-
Example 4	4.9	0.30	-	2.0	2.0	0.3	0.01	0.003	0.0005	0.0005	-
Example 5	5.2	0.31	-	3.1	0.5	-	0.01	0.002	0.0007	0.0004	0.0007
Example 6	6.1	0.29	0.6	2.2	2.0	-	0.01	0.002	0.0006	0.0006	-
Example 7	6.2	0.30	-	2.1	0.5	0.3	0.01	0.003	0.0006	0.0005	-
Example 8	6.2	0.28	-	2.8	1.5	-	0.01	0.003	0.0007	0.0005	-
Example 9	5.9	0.26	-	3.0	0.5	0.3	0.01	0.002	0.0005	0.0006	-
Example 10	6.6	0.25	-	1.9	1.5	0.5	0.01	0.003	0.0006	0.0005	-
Example 11	7.1	0.26	-	2.0	0.5	-	0.01	0.003	0.0006	0.0006	-
Example 12	7.0	0.23	0.8	2.1	2.0	-	0.01	0.002	0.0005	0.0005	-
Example 13	7.3	0.24	-	3.1	0.7	-	0.01	0.003	0.0006	0.0005	0.0004
Example 14	7.1	0.21	0.7	3.0	1.1	-	0.01	0.002	0.0005	0.0005	-
Comparative Example 6	12.2	0.2	3.3	-	4.8	-	0.02	0.003	0.0007	0.0009	0.0006
Comparative Example 7	11.1	0.25	0.2	0.3	1.1	0.5	0.02	0.003	0.0009	0.0008	0.0008
Comparative Example 8	11.8	0.2	0.96	2.1	3.0	0.10	0.03	0.003	0.0008	0.0007	0.0006
Comparative Example 9	12.1	0.31	0.95	-	2.9	0.05	0.95	0.003	0.0006	0.0008	0.0007
Comparative Example 10	11.9	0.24	3.1	2.2	1.0	-	0.03	0.003	0.0008	0.0007	0.0007

OIPE JC134
SEP 0 7 2004
PATENT & TRADEMARK OFFICE

Table 7. Mechanical properties and creep behavior

Alloy	TYS MPa			UTS MPa	E %	CYS MPa			MCR·10^9, s^{-1}	
	20°C	175°C	200°C	20°C	20°C	20°C	175°C	200°C	150°C, 100 MPa	200°C, 55 MPa
Example 1	175	160	145	227	5	172	155	143	1.30	1.96
Example 2	172	158	142	235	5	175	159	146	1.25	1.85
Example 3	183	165	154	237	4	183	165	155	0.84	1.05
Example 4	170	161	142	236	6	171	160	143	1.05	1.40
Example 5	180	168	152	235	4	179	168	153	0.80	1.08
Example 6	179	165	145	240	5	179	164	147	1.44	2.54
Example 7	178	163	148	238	5	176	163	146	1.39	2.44
Example 8	188	170	155	236	5	186	169	155	1.05	1.95
Example 9	186	172	157	232	4	186	172	157	0.95	1.88
Example 10	179	162	145	250	5	180	160	146	1.65	4.50
Example 11	180	160	143	248	5	179	160	142	1.64	4.80
Example 12	183	165	145	245	4	185	163	144	1.59	4.55
Example 13	196	170	158	230	3	192	170	157	1.25	2.25
Example 14	195	174	160	234	3	193	173	161	1.31	2.40
Comparative Example 6	205	125	95	282	3	202	127	88	195	275
Comparative Example 7	185	115	85	260	4	178	108	80	184	225
Comparative Example 8	188	122	105	265	4	184	119	99	164	198
Comparative Example 9	192	128	109	279	3	186	124	105	198	234
ComparativeExample10	190	120	105	272	2	185	115	101	168	205

Table 8. Chemical Compositions of Alloys

Alloy	Al %	Mn %	Zn %	Ca %	Sn %	Sr %	Si %	Fe %	Ni %	Cu %	Be %
Example 1	4.7	0.29	-	1.9	1.8	0.3	0.01	0.002	0.0006	0.0005	-
Example 2	5.3	0.31	0.3	1.8	0.3	-	0.01	0.002	0.0005	0.0006	0.0005
Example 3	5.1	0.30	-	2.9	1.0	-	0.01	0.003	0.0006	0.0006	-
Example 4	4.9	0.30	-	2.0	2.0	0.3	0.01	0.003	0.0005	0.0005	-
Example 5	5.2	0.31	-	3.1	0.5	-	0.01	0.002	0.0007	0.0004	0.0007
Example 6	6.1	0.29	0.6	2.2	2.0	-	0.01	0.002	0.0006	0.0006	-
Example 7	6.2	0.30	-	2.1	0.5	0.3	0.01	0.003	0.0006	0.0005	-
Example 8	6.2	0.28	-	2.8	1.5	-	0.01	0.003	0.0007	0.0005	-
Example 9	5.9	0.26	-	3.0	0.5	0.3	0.01	0.002	0.0005	0.0006	-
Example 10	6.6	0.25	-	1.9	1.5	0.5	0.01	0.003	0.0006	0.0005	-
Example 11	7.1	0.26	-	2.0	0.5	-	0.01	0.003	0.0006	0.0006	-
Example 12	7.0	0.23	0.8	2.1	2.0	-	0.01	0.002	0.0005	0.0005	-
Example 13	7.3	0.24	-	3.1	0.7	-	0.01	0.003	0.0006	0.0005	0.0004
Example 14	7.1	0.21	0.7	3.0	1.1	-	0.01	0.002	0.0005	0.0005	-
Comparative Example 11	6.0	0.37	0.89	0.45	0.12%RE	0.11	0.01	0.001	0.0006	0.0005	0.0008
Comparative Example 12	7.0	0.31	0.81	0.81	0.15%RE	0.07	0.01	0.001	0.0007	0.0006	0.0008
Comparative Example 13	6.9	0.32	0.83	1.08	0.13%RE	0.12	0.01	0.002	0.0008	0.0005	0.0009
Comparative Example 14	8.9	0.26	0.73	0.98	0.15%RE	0.09	0.01	0.002	0.0008	0.0006	0.0008
Comparative Example 15	8.8	0.24	0.77	0.75	0.92%RE	0.03	0.01	0.002	0.0009	0.0006	0.0011
Comparative Example 16	6.1	0.28	6.1	0.61	0.17%RE	0.13	0.01	0.002	0.0007	0.0006	0.0007
Comparative Example 17	5.4	0.34	6.8	0.78	0.13%RE	0.07	0.01	0.003	0.0007	0.0004	0.0006
Comparative Example 18	5.0	0.27	7.3	0.67	0.16%RE	0.08	0.01	0.003	0.0007	0.0005	0.0008
Comparative Example 19	5.5	0.29	6.7	0.85	0.92%RE	0.07	0.01	0.003	0.0008	0.0005	0.0008

OIPE
SEP 0 7 2004
JC134
TRADEMARK OFFICE

OIPE JC194
SEP 0 7 2004
PATENT & TRADEMARK OFFICE

Table 9. Mechanical Properties and Creep Behavior

Alloy	TYS MPa			UTS MPa	E %	CYS MPa			$MCR \cdot 10^9$, S^{-1}	
	20°C	175°C	200°C	20°C	20°C	20°C	175°C	200°C	150°C, 100 MPa	200°C, 55 MPa
Example 1	175	160	145	227	5	172	155	143	1.30	1.96
Example 2	172	158	142	235	5	175	159	146	1.25	1.85
Example 3	183	165	154	237	4	183	165	155	0.84	1.05
Example 4	170	161	142	236	6	171	160	143	1.05	1.40
Example 5	180	168	152	235	4	179	168	153	0.80	1.08
Example 6	179	165	145	240	5	179	164	147	1.44	2.54
Example 7	178	163	148	238	5	176	163	146	1.39	2.44
Example 8	188	170	155	236	5	186	169	155	1.05	1.95
Example 9	186	172	157	232	4	186	172	157	0.95	1.88
Example 10	179	162	145	250	5	180	160	146	1.65	4.50
Example 11	180	160	143	248	5	179	160	142	1.64	4.80
Example 12	183	165	145	245	4	185	163	144	1.59	4.55
Example 13	196	170	158	230	3	192	170	157	1.25	2.25
Example 14	195	174	160	234	3	193	173	161	1.31	2.40
ComparativeExample11	139	90	75	233	11.7	135	86	72	98.3	99.9
ComparativeExample12	143	92	76	215	7.2	136	90	74	74.6	77.3
ComparativeExample13	155	95	82	210	6.0	151	93	78	78.3	81.2
ComparativeExample14	167	100	86	223	4.9	162	98	80	77.4	79.7
ComparativeExample15	167	102	87	220	4.6	160	96	82	75.7	76.3
ComparativeExample16	164	94	88	227	4.4	163	92	84	69.4	72.1
ComparativeExample17	174	105	92	218	4.4	172	100	89	67.5	69.4
ComparativeExample18	178	102	94	215	4.0	176	98	93	66.4	67.4
ComparativeExample19	176	106	96	220	4.7	173	102	94	65.3	66.9